

FRAME CONSTRUCTION FOR AN AIR HANDLING UNIT

FIELD OF THE INVENTION

[0001] The present invention is directed to an air handling unit construction, and more particularly, is directed to structural connecting members forming the frame of the air handling unit.

BACKGROUND OF THE INVENTION

[0002] Air Handling Units (AHUs) are one of several components in cooling and heating systems. They are an important component as the AHU houses a number of components used in the system to provide forced air for climate control in a particular structure. AHU components typically include motors, heating/cooling coils, and blowers as well as the required interface connections to effect such climate control.

[0003] The AHU is an enclosed interconnected framed panel structure. The framed panel structures have insulated panels that are supported between structural framing members to define interconnected rectangular compartments. AHUs are typically large and bulky, the amount of floor space required to accommodate the AHU being commonly referred to as a "footprint." Due to the layout of a particular structure, the AHU may be located in any number of locations, including rooftop installations, wherein the AHU is exposed to the rigors of environmental exposure, such as rain or snow.

[0004] What is needed is an air handling unit construction provided with a single construction of structural members and corresponding interconnecting corner fittings to minimize costs associated with fabrication and installation the air handling unit.

SUMMARY OF THE INVENTION

[0005] The present invention relates to a corner fitting for constructing an air handling unit. The corner fitting includes three mutually perpendicular members having abutting sides forming an inside corner. A base having symmetry in three mutually perpendicular directions is defined by the abutting sides of the adjacent members. Each symmetrical portion of the base includes a first segment having a first end and a second end opposite the first end, the first end of the first

segment extending from one member opposite the inside corner. A second segment has a first end and a second end opposite the first end, the first end of the second segment extending from another member adjacent the one member opposite the inside corner. A plane of symmetry is coincident with a corner defined by the one member and the another member, wherein the first segment and the second segment being symmetrical with each other about the plane of symmetry. A closing portion has a first end and a second end, the first end of the closing portion being coincident with the second end of the first segment, the second end of the closing portion being coincident with the second end of the second segment, wherein the first segment, the second segment, the one member, the other member and the closing portion defining a closed geometry. The closed geometry extends for a predetermined length; and a leg extending from each closing portion away from the inside corner in a direction defined by the abutting sides of adjacent members forming the closing portion.

[0006] The present invention further relates to a framework for constructing an air handling unit compartment. The framework includes a plurality of structural fittings, each structural fitting including three mutually perpendicular members having abutting sides forming an inside corner. A base is provided having symmetry in three mutually perpendicular directions defined by the abutting sides of the adjacent members. Each symmetrical portion of the base includes a first segment having a first end and a second end opposite the first end, the first end of the first segment extending from one member opposite the inside corner. A second segment has a first end and a second end opposite the first end, the first end of the second segment extending from another member adjacent the one member opposite the inside corner. A plane of symmetry is coincident with the corner defined by the one member and the another member, wherein the first segment and the second segment being symmetrical with each other about the plane of symmetry. A closing portion has a first end and a second end, the first end of the closing portion being coincident with the second end of the first segment, the second end of the closing portion being coincident with the second end of the second segment, wherein the first segment, the second segment, the one member, the other member and the closing portion defining a closed geometry, the closed geometry extending for a predetermined length. A leg extends from each closing portion away from the inside corner in a direction defined by the abutting sides of adjacent members forming the closing portion. Each structural fitting of the plurality of

structural fittings is configured to receive an end of at least two structural members to connect the at least two structural members, the plurality of structural fittings and the plurality of structural members being interconnected to form the framework.

[0007] The present invention still further relates to an air handling unit construction including a plurality of corner fittings. Each corner fitting includes three mutually perpendicular members having abutting sides forming an inside corner. A base has symmetry in three mutually perpendicular directions defined by the abutting sides of the adjacent members. Each symmetrical portion of the base includes a first segment having a first end and a second end opposite the first end, the first end of the first segment extending from one member opposite the inside corner. A second segment has a first end and a second end opposite the first end, the first end of the second segment extending from another member adjacent the one member opposite the inside corner. A plane of symmetry is coincident with a corner defined by the one member and the another member, wherein the first segment and the second segment being symmetrical with each other about the plane of symmetry. A closing portion has a first end and a second end, the first end of the closing portion being coincident with the second end of the first segment, the second end of the closing portion being coincident with the second end of the second segment. The first segment, the second segment, the one member, the other member and the closing portion defining a closed geometry, the closed geometry extending for a predetermined length. A leg extends from each closing portion away from the inside corner in a direction defined by the abutting sides of adjacent members forming the closing portion. Each structural fitting of the plurality of structural fittings is configured to receive an end of at least two structural members to connect the at least two structural members, the plurality of structural fittings and the plurality of structural members being interconnected to form the framework. A plurality of panels are each received by a frame of the plurality of frames to form an enclosed structure.

[0008] The present invention yet further relates to an edge frame for an insulated panel for constructing an air handling unit. The edge frame includes a base having a first end and a second end opposite the first end, with a first leg extending from the first end. A second leg opposite the first leg extends from the second end, and a retention device extends from the base between the first leg and the second leg, the retention device being configured to secure an end of an insulated panel between at least one of the first leg and the retention device and the second leg

and the retention device. A first seal extends from the first end substantially opposite the first leg, and a second seal extends from the second leg away from the retention device. The first and second seals are disposed to provide a seal with parallel sealing surfaces.

[0009] An advantage of the present invention is that it minimizes costs associated with fabrication and installation of air handling units.

[0010] A further advantage of the present invention is a unitary structural member construction that is symmetric about a plane of symmetry, permitting a single structural member construction.

[0011] A further advantage of the present invention is a corner fitting construction having legs that are each symmetric about a plane of symmetry, permitting a single corner fitting construction.

[0012] A further advantage of the present invention is that it provides a substantially uniform, continuous, identical seam or recess for receiving insulated panels when the structural members are assembled into structural member frames.

[0013] A further advantage of the present invention is the provision of structural members that have resilient flared seals which provide enhanced sealing between the insulated panels and the structural member frames.

[0014] A further advantage of the present invention is the provision of splice fittings that provide a substantially uniform, continuous, identical seam or recess for receiving insulated panels when the structural members are assembled into structural member frames.

[0015] A further advantage of the present invention is the provision of a corner fitting of unitary construction.

[0016] A further advantage of the present invention is the provision of a corner fitting cap of unitary construction.

[0017] A further advantage of the present invention is the provision of a floor panel that channels collected condensation for removal from the air handling unit.

[0018] Other features and advantages of the present invention will be apparent from the following more detailed description of the preferred embodiment, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Fig. 1 is an overall perspective view of an AHU frame of the present invention.

[0020] Fig. 2 is a partially exploded perspective view of an AHU construction of the present invention.

[0021] Fig. 3 is a perspective view of a corner fitting of the present invention.

[0022] Fig. 4 is a perspective view of the opposite side of the corner fitting of Fig. 3 of the present invention.

[0023] Fig. 5 is a cross section taken along line 5-5 of Fig. 6 of a base of the corner fitting of the present invention.

[0024] Fig. 6 is a plan view of the corner fitting of the present invention.

[0025] Fig. 7 is a cross section of the corner fitting taken along line 7-7 of Fig. 6 of the present invention.

[0026] Fig. 8 is a perspective view of a splice fitting of the present invention.

[0027] Fig. 9 is a perspective view of the opposite side of the splice fitting of the present invention.

[0028] Fig. 10 is a cross section of a transverse leg of the splice fitting taken along line 10-10 of Fig. 8 of the present invention.

[0029] Fig. 11 is a perspective view of a structural member of the present invention.

[0030] Fig. 12 is a plan view of the structural member of the present invention.

[0031] Fig. 13 is a perspective view of a splice member of the present invention.

- [0032] Fig. 14 is an end view of the splice member of the present invention.
- [0033] Fig. 15 is a perspective view of a corner fitting cap of the present invention.
- [0034] Fig. 16 is a perspective view of the opposite side of the corner fitting cap of the present invention.
- [0035] Fig. 17 is a cross section of one leg of the corner fitting cap taken along line 17-17 of Fig. 15 of the present invention.
- [0036] Fig. 18 is a perspective view of the splice fitting cap of the present invention.
- [0037] Fig. 19 is a perspective view of the opposite side of the splice fitting cap of Fig. 18 of the present invention.
- [0038] Fig. 20 is a cross section of the splice fitting cap taken along line 20-20 of Fig. 19 of the present invention.
- [0039] Fig. 21 is a perspective view of a structural member cap of the present invention.
- [0040] Fig. 22 is an end view of the structural member cap of the present invention.
- [0041] Fig. 23 is a perspective view of a splice member cap of the present invention.
- [0042] Fig. 24 is a perspective view of an insulated panel edge frame of the present invention.
- [0043] Fig. 25 is an end view of the insulated panel edge frame of the present invention.
- [0044] Fig. 26 is an end view of a corner portion of a corner fitting connected to a corner fitting cap and then connected to an insulated panel frame of the present invention.
- [0045] Fig. 27 is an end view of a structural member connected to a structural member cap and then connected to an insulated panel frame of the present invention.
- [0046] Fig. 28 is an end view of a splice member connected to a splice member cap and then connected to an insulated panel frame of the present invention.

[0047] Fig. 29 is an exploded perspective view of a floor panel of the present invention.

[0048] Fig. 30 is a partially assembled AHU construction of the present invention.

[0049] Fig. 31 is an end view of an alternate embodiment of the insulated panel edge frame of the present invention.

[0050] Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

DETAILED DESCRIPTION OF THE INVENTION

[0051] One embodiment of a framework 10 that incorporates the constructions of the present invention is depicted in Fig. 1. Framework 10 includes a number of interconnected frames 12 each forming one side of the preferably rectangular framework 10. The interconnected frames 12 include a number of structural members 14, also referred to as raceways, interconnected by corner fittings 16. It is desirable in interconnected frames 12 exceeding a predetermined size to divide the larger structural members 14 required for the frame 12 into two or more shorter in-line structural members and interpose a splice fitting 18 therebetween. Splice fittings 18 have a pair of opposed legs 84 that are each inserted inside one end of adjacent in-line structural members 14. Additionally, splice fittings 18 each have a second pair of legs 20 that extend in a transverse direction from the direction of the opposed legs 84 that secure adjacent in-line structural members 14. Preferably, each pair of in-line transverse legs 20 of adjacent splice fittings 18 secure a splice member 22 therebetween. Even when splice members and fittings 18, 22 are used, the seams or recesses formed along each frame 12 are uniform and continuous to receive specially configured edge frames 24 of insulated panels 26. Optionally, referring to Fig. 2, reinforcing members 28 can be affixed to adjacent structural members 14 to provide additional rigidity to the framework 10, such as adjacent the corners of the framework 10. Assembling the panels 26 to the framework 10 forms an air handling unit 30 (AHU) (Fig. 2). Preferably, edge frames 24 surrounding the periphery of the panels 26 provide multiple seals with each frame 12 of the framework 10 to provide substantially reduced air leakage during operation of the AHU 30.

[0052] Referring to Figs. 3-7, corner fitting 16 includes three mutually perpendicular interconnected abutting members 34. The abutment of adjacent members 34 each form an abutting corner 36, the abutting corners 36 converging to form an inside corner 38 or common corner. Preferably, each of the members 34 are substantially similar in size, and more preferably, each member 34 defines a square so that collectively, the members 34 define three sides of a cube. Corner fitting 16 also includes a base 32 further having three base portions 37 that each extend in a mutually perpendicular direction defined by a respective abutting corner 36.

[0053] Each symmetrical base portion 37 of the corner fitting 16 includes a first segment 40 having a first end 42, that extends from member 34 opposite the abutting corner 36 and the inside corner 38, and a second end 44 preferably opposite the first end 42. Adjacent the second end 44 is a channel 54 that preferably extends substantially parallel to the abutting corner 36 along the length of the corner portion 37. A second segment 46 has a first end 48, that extends from an adjacent member 34 opposite the abutting corner 36 and the inside corner 38, and a second end 50 preferably opposite the first end 48. Adjacent the second end 50 is a channel 58 that preferably extends substantially parallel to the abutting corner 36 along the length of the corner portion 37. Channels 54, 58 provide a means to secure a corner fitting cap 200 (Figs. 15-17) to be discussed in additional detail below. A closing portion 52 extends from the second end 44 of the first segment 40 to the second end 50 of the second segment 46. A segment of the closing portion 52 adjacent the second end 44 extends to a shoulder 56, and a segment of the closing portion 52 adjacent the second end 50 extends to a shoulder 60. The first segment 40, second segment 46, closing portion 52 and portions of adjacent members 34 define a closed geometry 64. A plane of symmetry 62 coincident with the abutting corner 36 bisects closed geometry 64. Stated another way, in one preferred embodiment, the first segment 40, the portion of the member 34 extending from the abutting corner 36 to the first end 42 of the first segment 40, and the portion of the closing portion 52 that extends from the second end 44 of the first segment 40 to a point which is coincident with the plane of symmetry 62 is symmetric about the plane of symmetry 62 with the second segment 46, the portion of the member 34 extending from the abutting corner 36 connected to the first end 48 of the second segment 46, and the portion of the closing portion 52 that extends from the second end 50 of the second segment 46 to a point which is coincident with the plane of symmetry 62. In one embodiment, the closing portion 52

of each symmetrical portion 37 includes a beveled portion 33, with the beveled portions 33 converging to define a beveled corner 35.

[0054] Extending from each symmetrical portion 37 in a direction away from the inside corner 38 along a respective abutting corner 36 is a leg 66 that further extends to a tapered portion 68. Each leg 66 is configured to receive one end of the structural member 14.

[0055] Referring to Figs. 11-12, the structural member 14 is connected to each of the legs 66 of the corner fitting 16 to form the corner of the framework 10. The structural member 14 includes a pair of substantially perpendicular members 116 that abut to form a corner 118. A first segment 120 having a first end 122 that extends from member 116 opposite the abutting corner 118 and a second end 124 preferably opposite the first end 122. Adjacent the second end 124 is a channel 134 that preferably extends substantially parallel to the abutting corner 118 along the length of the structural member 14. A second segment 126 has a first end 128, that extends from an adjacent member 116 opposite the abutting corner 118, and a second end 130 preferably opposite the first end 128. Adjacent the second end 130 is a channel 138 that preferably extends substantially parallel to the abutting corner 118 along the length of the structural member 14. Channels 134, 138 provide a means to secure a structural member cap 234 (Figs. 21-22) to be discussed in additional detail below. A closing portion 132 extends from the second end 124 of the first segment 120 to the second end 130 of the second segment 126. A segment of the closing portion 132 adjacent the second end 124 extends to a shoulder 136, and a segment of the closing portion 132 adjacent the second end 130 extends to a shoulder 140. The first segment 120, second segment 126, closing portion 132 and portions of adjacent members 116 define a closed geometry 144. A plane of symmetry 142 coincident with the abutting corner 118 bisects closed geometry 144. Stated another way, in one preferred embodiment, the first segment 120, the portion of the member 116 extending from the corner 118 to the first end 122 of the first segment 120, and the portion of the closing portion 132 that extends from the second end 130 of the first segment 120 to a point which is coincident with the plane of symmetry 142 is symmetric about the plane of symmetry 142 with the second segment 126, the portion of the member 116 extending from the corner 118 to the first end 128 of the second segment 126, and the portion of the closing portion 132 that extends from the second end 130 of the second segment 126 to a point which is coincident with the plane of symmetry 142.

[0056] In a preferred embodiment, both the periphery of closed geometry 144 and members 116 of structural member 14 are substantially identical to the periphery of closed geometry 64 and members 34 of one corner portion 37 of the corner fitting 16. In other words, upon assembly of structural member 14 with the corner fitting 16, such as by the closed geometry 144 of the structural member 14 receiving one leg 66 of one corner portion 37 of the corner fitting 16, all corresponding components are aligned to form an effectively seamless joint therebetween.

[0057] Referring to Figs. 8-10, splice fitting 18 includes a pair of substantially perpendicular members 72 that abut to form a corner 74. Opposed lateral edges 76 of members 72 of splice fitting 18 which are normal to the corner 74 abut ends of corresponding members 116 of in-line structural members 14 (Figs. 11-12) when assembled, as shown in Fig. 1. Preferably, splice fitting 18 includes a base 70 having an opposed first segment 78, second segment 80 and closing portion 82 that is coplanar with each lateral edge 76 which is sized substantially similarly to the respective first segment 120, second segment 126 and closing portion 132 of the structural member 14. Therefore, upon assembly of one end of the structural member 14 to the splice fitting 18 which is achieved by directing one leg 84 into one end of the structural member 14 until the one end of the structural member 14 abuts lateral edge 76 of the splice fitting 18, all corresponding components of the splice fitting 18 and the structural member 14 are aligned to form an effectively seamless joint therebetween.

[0058] In addition to providing a seamless joint with the ends of in-line structural members 14, transverse portion 79 of base 70 of the splice fitting 18 further includes a first segment 90 having a first end 92 that extends from member 72 opposite the corner 74 and a second end 94 preferably opposite the first end 92. Adjacent the second end 94 is a channel 104 that preferably extends substantially perpendicular to the corner 74 along the length of the transverse portion 79. A second segment 96 has a first end 98 that extends from member 72 opposite the corner 74 and a second end 100 preferably opposite the first end 98. Adjacent the second end 100 is a channel 108 that preferably extends substantially perpendicular to the corner 74 along the length of the transverse portion 79. Channels 104, 108 provide a means to secure a splice fitting cap 218 (Figs. 18-20) to be discussed in additional detail below. A closing portion 102 extends from the second end 94 of the first segment 90 to the second end 100 of the second segment 96. The closing portion 102 adjacent the second end 94 extends to a shoulder 106, and the closing portion

102 adjacent the second end 100 extends to a shoulder 110. The first segment 90, second segment 96, closing portion 102 and member 72 define a closed geometry 114. In the preferred embodiment, a plane of symmetry 112 perpendicular to the corner 74 bisects closed geometry 114. Stated another way, the first segment 90, a portion of the member 72 extending from a point that is coincident with the plane of symmetry 112 to the first end 92 of the first segment 90, and the portion of the closing portion 102 that extends from the second end 94 of the first segment 90 to a point which is coincident with the plane of symmetry 112, is symmetric about the plane of symmetry 112 with the second segment 96, a portion of the member 72 extending from a point that is coincident with the plane of symmetry 112 to the first end 98 of the second segment 96, and the portion of the closing portion 102 which extends from the second end 100 of the second segment 96 to a point that is coincident with the plane of symmetry 112.

[0059] Base 70 includes opposed in-line portions 73 and opposed transverse portions 79. The in-line portions 73 each extend to legs 84 for receiving one end of structural members 14, while the transverse portions 79 each extend perpendicular to each other, and also perpendicular to the in-line portions 73, for receiving one end of splice members 22 (see Fig. 13). Although the exterior cross sectional profiles defined by in-line portion 73 and transverse portion 79 can be different (e.g., in-line portion 73 being substantially similar to Fig. 12 of structural member 14 versus Fig. 10 of transverse portion 79), in one preferred embodiment, several elements are common to both portions 73, 79 to provide a seamless transition therebetween. For example, as shown in Fig. 10, one side of transverse portion 79 includes shoulder 106 and channel 104. Referring to Fig. 9, shoulder 106 and channel 104 extend from transverse portion 79 to in-line portion 73, preferably defining an L-shape. Similarly, also as shown in Fig. 10, the opposite side of transverse portion 79 includes shoulder 110 and channel 108. Again referring to Fig. 9, shoulder 110 and channel 108 extend from transverse portion 79 to in-line portion 73, also preferably defining an L-shape. In other words, shoulder 106 and channel 104 extend between adjacent sides of in-line portion 73 and transverse portion 79, as does shoulder 110 and channel 108, providing continuous edges between adjacent in-line portions 73 and transverse portions 79.

[0060] Referring to Figs. 13-14, splice member 22 includes a member 146 having opposed lateral edges 151 to abut an edge 77 (Fig. 8) of corresponding member 72 of splice fitting 18 when assembled, as shown in Fig. 1. The closed geometry 172 of one end of the splice member

22 receives one leg 20 of the splice fitting 18. The splice member 22 includes a first segment 148 having a first end 150 that extends from member 146 and a second end 152 which preferably is opposite the first end 150. Portion 147 of member 146 extends outwardly from first end 150. Adjacent the second end 152 of the first segment 148 is a channel 162 that preferably extends substantially parallel to the member 146 along the length of the splice member 22. A second segment 154 has a first end 156 that extends from member 146 and a second end 158 which preferably is opposite the first end 156. Portion 149 of member 146 extends outwardly from first end 156. Adjacent the second end 158 of the second segment 154 is a channel 166 that preferably extends substantially parallel to the member 146 along the length of the splice member 22. Channels 162, 166 provide a means to secure a splice member cap 246 (Fig. 23) to be discussed in additional detail below. A closing portion 160 extends from the second end 152 of the first segment 148 to the second end 158 of the second segment 154. The closing portion 160 adjacent the second end 152 extends to a shoulder 164, and the closing portion 160 adjacent the second end 158 extends to a shoulder 168. The first segment 148, second segment 154, closing portion 160 and a portion of member 146 define a closed geometry 172. Preferably, a plane of symmetry 170 perpendicular to the member 146 bisects closed geometry 172. Stated another way, in one preferred embodiment, the first segment 148, the portion of the member 146 extending from a point that is coincident with the plane of symmetry 170 to the first end 150 of the first segment and the portion of the closing portion 160 that extends from the second end 152 of the first segment 148 to a point which is coincident with the plane of symmetry 170 is symmetric about the plane of symmetry 170 with the second segment 154, the portion of the member 146 extending between a connection to the first end 156 of the second segment 154 and the point of coincidence with the plane of symmetry 170, and the portion of the closing portion 160 that extends from the second end 158 of the second segment 154 to a point which is coincident with the plane of symmetry 170.

[0061] Preferably, the first segment 148, second segment 154 and closing portion 160 are coincident and coplanar with each lateral edge 151 of splice member 22 and sized substantially similarly to the respective first segment 90, second segment 96 and closing portion 102 of the splice fitting 18. Therefore, upon assembly of one end of the splice member 22 to the splice fitting 18 which is achieved by directing one leg 20 into one end of the splice member 22 until

the one end of the splice member 22 abuts the edge 77 of the splice fitting 18, all corresponding components are aligned to form an effectively seamless joint therebetween.

[0062] Referring to Figs. 15-17, corner fitting cap 200 preferably includes three mutually perpendicular portions 202 that correspond to the corner portions 37 of corner fitting 16. Each portion 202 of the corner fitting cap 200 includes a curved section 204 having shoulders 206 extending from each end of the curved section 204. A flange 208 extends inwardly from each shoulder 206 and a lip 210 extending inwardly from the flange to be substantially parallel to the shoulder 206. Adjacent flanges 208 from adjacent perpendicular portions 202 form a corner 212. A rib 214 extends inwardly from the curved section 204 toward the opposed lips 210. Preferably, the three ribs 214, one rib 214 for each respective perpendicular portion 202, are centered with respect to the curved section 204, thereby the ribs 214 being mutually perpendicular to each other and converging to a point 217. The outer portion of the curved sections 204 similarly converge to form a rounded corner portion 216, providing a smooth, sleek appearance. In an alternate embodiment, each curved section 204 can have more than one rib 214.

[0063] To assemble the corner fitting cap 200 to the corner fitting 16, the corner fitting cap 200, which is positioned as shown in Fig. 16, is directed over corner fitting 16 which is positioned as shown in Fig. 4. That is, the mutually perpendicular portions 202 of the corner fitting cap 200 are aligned with corresponding corner portions 37 of the corner fitting 16. The opposed pair of lips 210 of each of the mutually perpendicular portions 202 are brought into engagement with respective channels 54, 58 of each corner portion 37. Simultaneously, the ribs 214 of each mutually perpendicular portion 202 are brought into contact with the corresponding beveled edge 33 of the base 32 of the corner fitting 16, providing a secure engagement between the corner fitting cap 200 and the corner fitting 16.

[0064] Referring to Figs. 18-20 is a splice fitting cap 218 that is configured to overlies and engage the base 70 of the splice fitting 18. Splice fitting cap 218 includes a curved section 220 that extends outwardly to shoulders 222 on opposite ends of the curved section 220. Preferably, the shoulders 222 extend perpendicularly away each other. Each shoulder 222 extends to an inwardly directed flange 224, the flanges 224 preferably being perpendicular to each other. The

flanges 224 then extend to inwardly directed lips 226 that also preferably inwardly extend toward each other in directions perpendicular to each other. A cutout 228 is formed along the juncture of each flange 224 and lip 226, the cutout 228 preferably being configured to conformably receive the closing portion 102 of the transverse portion 79 of the splice fitting 18.

[0065] To assemble the splice fitting cap 218 to the splice fitting 18, the cutouts 228 of curved section 220 are each directed over and into contact with one corresponding closing portion 102 of the splice fitting 18. Preferably, as the cutout 228 is brought into contact with the closing portion 102, the lips 226 engage channels 104, 108 extending along the in-line portions 73 of the base 70 of the splice fitting 18. At least one, and preferably two, ribs 232 inwardly extending from the curved section 220 toward each other are sized to contact the base 70 to secure the splice fitting cap 218 in a fixed, stable position against the splice fitting 18. In one preferred embodiment, the length of the splice fitting cap 218 is sized to match the length of the base 70 of the splice fitting 18. Further, a projection 230 extends outwardly from each shoulder 222 in a direction away from the flange 224 that is transverse to the shoulder 222. The projection 230 is preferably sized and disposed to align with an adjacent splice member cap 246 (see Fig. 23) that overlies the splice member 22. The splice fitting cap 218 provides additional insulative performance to the AHU by trapping air in the gap between the splice fitting cap 218 and the splice fitting 18.

[0066] Referring to Figs. 21-22 is a structural member cap 234 that is preferably configured to overlie and engage the length of structural member 14. Structural member cap 234 includes a curved section 236 that extends outwardly to shoulders 238 on opposite ends of the curved section 236. Preferably, the shoulders 238 extend perpendicularly away each other. Each shoulder 238 extends to an inwardly directed flange 240, the flanges 240 preferably being perpendicular to each other. The flanges 240 then extend to inwardly directed lips 242 that also preferably inwardly extend toward each other in directions perpendicular to each other. In a preferred embodiment, the structural member cap 234 is conformably secured to the structural member 14.

[0067] To assemble the structural member cap 234 to the structural member 14, the open end (the side facing lips 242) of the structural member cap 234 are each directed over and on

opposite sides of the closing portion 132 of the structural member 14. Preferably, the lips 242 are brought into contact with the closing portion 132, the lips 226 engaging channels 134, 136 which extend along the length of the structural member 14. Ribs, such as a pair of mutually perpendicular ribs 244, extend inwardly from the curved section 236 toward each other to contact corresponding perpendicular portions 133 of the structural member 14 to secure the structural member 14 in a fixed, stable position against the structural member cap 234. Additionally and preferably, at least one additional rib 245 that extends from the curved section 236 is interposed between the ribs 244 to contact the beveled portion 135 of the structural member 14 to further secure the structural member cap 234 to the structural member 14. In one preferred embodiment, the length of the structural member cap 234 is sized to match the length of the structural member 14. The structural member cap 234 provides additional insulative performance to the AHU by trapping air in the gap between the structural member cap 234 and the structural member 14.

[0068] Referring to Fig. 23 is a splice member cap 246 that is preferably configured to overlie and engage the length of splice member 22. Splice member cap 246 includes a peak 248 that extends outwardly to shoulders 250 on opposite ends of the peak 248. Preferably, the shoulders 250 extend in-line away from each other. Each shoulder 250 extends to an opposed flange 252, the flanges 252 preferably being parallel to each other. The flanges 252 then extend to inwardly directed lips 254 that also preferably in-line with each other. In a preferred embodiment, the splice member cap 246 is conformably secured over the closing portion 160 of the splice member 22.

[0069] To assemble the splice member cap 246 over the splice member 22, the open end (the side facing lips 254) of the splice member cap 246 are each directed over and on opposite sides of the closing portion 160 of the splice member 22. Preferably, the lips 254 are brought into contact with the closing portion 160, the lips 254 engaging channels 162, 166 which extend along the length of the splice member 22. A rib 256 preferably extends from the peak 248 between flange 252 to contact the closing portion 160 to secure the splice member 22 in a fixed, stable position against the splice member cap 246. In one preferred embodiment, the length of the splice member cap 246 is sized to match the length of the splice member 22. The splice member cap 246 provides additional insulative performance to the AHU by trapping air in the

gap between the splice member cap 246 and the splice member 22. Additionally, the splice member cap 246 can be provided in any number of different colors to provide a pleasing appearance, so that the splice member 22 can be fabricated of a single color, if desired, because the installed splice member cap 246 overlies and masks the splice member 22 from view from outside the AHU.

[0070] One having skill in the art further appreciates that the materials used to fabricate the components of the AHU of the present invention preferably have a low coefficient of thermal conductivity. Additionally, any of the corner fitting caps, including the corner fitting cap 200, splice fitting cap 218, structural member cap 234 and splice member cap 246, can be provided in any number of different colors to provide a pleasing appearance, so that the corresponding respective corner fitting 16, splice fitting 18, structural member 14 and splice member 22 can be fabricated of a single color, if desired, because the installed caps overlie and mask their respective structural component from view from outside the AHU.

[0071] Referring to Figs. 24-25 is edge frame 24 that surrounds the periphery of insulated panels 26 which are inserted into frames 12 of framework 10, forming the AHU. Edge frame 24 includes a base portion 300 having a first end 302 that is opposite a second end 304, and a protrusion 306 which is interposed between the first end 302 and second end 304. A leg 308 extends from first end 302 in a direction opposite of the protrusion 306, and a leg 310 extends from second end 304, also in a direction opposite of the protrusion 306. Preferably, legs 308, 310 are parallel to each other, with legs 308, 310 and base portion 300 defining a C-shape. A retention device 312 is provided to secure the edge frame 24 to one end of the insulated panel 26. Preferably, retention device 312 includes a pair of opposed first and second portions 314, 316. One first portion 314 extends from base portion 300 in a direction opposite of protrusion 306, the first portion 314 preferably being directed at an acute angle A toward leg 308. Upon the first portion 314 terminating at an end 315, a second end 316 extends preferably at an acute angle B away from leg 308, end 315 providing a peak or location of minimum distance between the leg 308 and the first and second portions 314, 316. Similarly, the opposed first and second portions 314, 316 at end 315 form a peak between the leg 310 and the first and second portions 314, 316. To assemble an insulated panel for use in the AHU construction, opposite portions 319 of one end of the insulated panel 26 are directed between opposed legs 308, 310 of base portion 300.

As insulated panel 26 is further directed into base portion 300, each end 315 of the retention device 312 contacts the inside surface of one of the opposed portions 319 of the insulated panel 26, compressing one opposed portion 319 of the insulated panel 26 between end 315 and leg 308 and the other opposed portion 319 of the insulated panel 26 between end 315 and leg 310 of the edge frame 24. The insulated panel 26 is directed further inside the edge frame 24 until the opposed portions 319 abut the base portion 300. Although the frictional contact developed between the end portions 319 of the insulated panel 26 and the edge frame 24 are typically sufficient to secure the insulated panel 26 and the edge frame 24 together, adhesive or fasteners of known construction can additionally be used if desired.

[0072] In an alternate embodiment, referring to Fig. 31, the retention device 312 can be configured to accommodate thin insulated panels 26. The end 315 of each of the first portions 314 is directed toward respective legs 308, 310, so that the ends 315 compress insulated panel 26 therebetween, developing sufficient frictional contact between the ends 315 and the insulated panel 26 to secure the insulated panel and the edge frame 24 together.

[0073] To seal the insulated panel 26 to the frame of the AHU, a flared seal 320, and preferably an opposed pair of flared seals 320, extend outwardly from leg 310, facing away from retention device 312. Preferably, each flared seal 320 extends nonlinearly, or curves, from leg 310. Flared seal 320 is composed of a flexible material so that upon contact with a sealing surface, such as member 116 of structural member 14, the flared seal 320 deflects to conform to a contacting portion of the sealing surface, providing a substantially fluid tight seal between the seal 320 and the sealing surface. An additional seal 318 preferably extends from first end 302 of base portion 300 that is generally in-line with leg 308. Preferably, seal 318 provides a supplemental seal, such as a blade seal, with a second sealing surface to provide an enhanced, substantially fluid tight seal between the frame 12 and the edge frame 24 of the insulated panel 26. While in one embodiment the edge frame 24 can be fabricated of unitary construction so that all of its elements have substantially the same material properties, e.g., flexibility, the present invention is not so limited. That is, edge frame 24 can be fabricated of unitary construction so that seals 318, 320 exhibit flexibility, while the remaining elements of the edge frame 24 exhibit rigidity. For example, edge frame 24 can be constructed of polyvinyl chloride (PVC) or other plastics or polymers to achieve desired properties for selected portions of the cross section of a

formed geometry. In addition, protrusion 306 preferably also contacts the sealing surface between the seals 318, 320, bifurcating the space between the seals 318, 320 to provide yet further enhanced sealing. By use of this multiple-stage or supplemental sealing system, the present invention does not require an additional layer of resilient material that is typically affixed to the periphery of the frame 12 prior to receiving the insulated panel 26, which reduces the number of component parts, fabrication complexity and the amount of fabrication labor to construct the AHU.

[0074] The orientation of the seals 318, 320 are preferably configured to contact parallel surfaces of the frame 12. This orientation provides several benefits, including evenly spreading the weight of the insulated panel 26 over the surface of all the seals 318, 320 when the insulated panel 26 is mounted horizontally, such as for a roof or floor panel. Further, when the insulated panel 26 is mounted vertically, such as for the walls of the AHU, the seals 318, 320 do not bear the weight of the insulated panel 26 so that the seals 320 will be less likely to flatten between the insulated panel 26 and the frame 12, reducing the effectiveness of the seal 320. To more effectively center the insulated panel 26 within the receiving frame 12, the protrusions 306 provide a rounded contact surface between the edge frame 24 and the frame 12, and ease installation and removal between the insulated panel 26 and the frame 12.

[0075] In a typical assembly of the AHU construction of the present invention, fasteners, such as screws or bolts, can be used to secure the structural components together. Use of such fasteners permits disassembly and reassembly, if desired. To assist with location of fasteners, shallow alignment grooves can be formed in the structural members and splice members that run parallel to the perpendicular members. Alternately, other permanent means of assembly, such as adhesives, or other bonding methods known in the art can also be used.

[0076] Referring to Figs. 26-28, the interconnection of the AHU construction of the present invention is now discussed. Corner fitting cap 200 overlies corner fitting 16 as shown in Fig. 26, with each opposed lip 210 of corner fitting cap 200 being received by respective channels 54, 58. Rib 214 which extends from curved section 204 of corner fitting cap 200 abuts beveled edge 33 of base 52 of corner portion 37 of corner fitting 16 to maintain the corner fitting cap 200 at a fixed position with respect to corner fitting 16. Closed geometries 201 which are formed

between corner fitting cap 200 and corner fitting 16, provide enhanced insulative performance for the AHU construction.

[0077] Once corner fitting cap 200 has been assembled to corner fitting 16, insulated panel 26 is assembled to portions of both of corner fitting cap 200 and corner fitting 16. Flared seals 320 which extend from leg 310 of the edge frame 24 are directed toward member 34 of corner fitting 16 until second end 304 of base portion 300 of edge frame 24 is adjacent first end 42 of first segment 40 of corner fitting 16. Upon second end 304 being directed sufficiently adjacent to first end 42, the flared seals 320 conformally abut member 34 providing a first substantially fluid tight seal therebetween; the protrusion 306 of edge frame 24 abuts first segment 40 providing a second seal therebetween; and the seal 318 conformally abuts shoulder 206 providing an additional seal therebetween that is substantially fluid tight. In addition, closed geometries 301, each formed between at least two of corner fitting cap 200, corner fitting 16 and edge frame 24 provide yet further insulative performance for the AHU construction.

[0078] Structural member cap 234 overlies structural member 14 as shown in Fig. 27, with each opposed lip 242 of structural member cap 234 being received by respective channels 134, 138. Perpendicular ribs 244 which extend from curved section 236 of structural member cap 234 each abut perpendicular portions 133 of closing portion 132 of structural member 14, and central rib 245 that extends from structural member cap 234 abuts beveled portion 135 of closing portion 132 of structural member 14 to maintain the structural member cap 234 at a fixed position with respect to structural member 14. Closed geometries 203 which are formed between structural member cap 234 and structural member 14, provide enhanced insulative performance for the AHU construction.

[0079] Once structural member cap 234 has been assembled to structural member 14, insulated panel 26 is assembled to portions of both of structural member cap 234 and structural member 14. Flared seals 320 which extend from leg 310 of the edge frame 24 are directed toward member 116 of structural member 14 until second end 304 of base portion 300 of edge frame 24 is adjacent first end 122 of first segment 120 of structural member 14. Upon second end 304 being directed sufficiently adjacent to first end 122, the flared seals 320 conformally abut member 116, providing a first substantially fluid tight seal therebetween; the protrusion 306

of edge frame 24 abuts first segment 120, providing a second seal therebetween; and the seal 318 conformally abuts shoulder 238, providing an additional seal therebetween that is substantially fluid tight. In addition, closed geometries 303, each formed between at least two of structural member cap 234, structural member 14 and edge frame 24 provide yet further insulative performance for the AHU construction.

[0080] Splice member cap 246 overlies splice member 22 as shown in Fig. 28, with each opposed lip 254 of splice member cap 246 being received by respective channels 162, 166. Rib 256 which extends from splice member cap 246 abuts closing portion 160 of splice member 22 to maintain the splice member cap 246 at a fixed position with respect to splice member 22. Closed geometries 205 which are formed between splice member cap 246 and splice member 22 provide enhanced insulative performance to the AHU construction.

[0081] Once splice member cap 246 has been assembled to splice member 22, insulated panel 26 is assembled to portions of both of splice member cap 246 and splice member 22. Flared seals 320 which extend from leg 310 of the edge frame 24 are directed toward member 146 of splice member 22 until second end 304 of base portion 300 of edge frame 24 is adjacent first end 150 of first segment 148 of splice member 22. Upon second end 304 being directed sufficiently adjacent to first end 150, the flared seals 320 conformally abut member 146, providing a first substantially fluid tight seal therebetween; the protrusion 306 of edge frame 24 abuts first segment 148, providing a second seal therebetween; and the seal 318 conformally abuts shoulder 250, providing an additional seal therebetween that is substantially fluid tight. In addition, closed geometries 305, each formed between at least two of splice member cap 246, splice member 22 and edge frame 24 provide yet further insulative performance for the AHU construction.

[0082] Referring to Fig. 29 is a floor panel 400 that includes a lower portion 404 that supports an upper portion 402. Lower portion 404 includes a base 406 having interconnected upwardly extending walls 408 that surround the periphery of the base 406. Upper portion 402 includes a floor 410 having a drain 411 at one end to direct collected water, primarily from condensation, away from the floor 410, the floor 410 having interconnected walls 412 forming a periphery around the floor 410. The walls 412 extend to interconnected flanges 414 forming a

peripheral frame 401 that is supported from beneath by the walls 408 of the lower portion 404. The wall 412 adjacent drain 411 is of greater height than the wall 412 at the opposite end of the floor 410, providing a sloped surface to facilitate the draining of any water that condenses on components in the AHU which then falls onto the floor 410. To provide enhanced insulation, floor panel 400 preferably includes a pair of raised portions 416 composed of a material having low thermal conductivity, such as acrylonitrile-butadiene-styrene (ABS), and injected with a material, such as polyurethane, if desired. One having skill in the art appreciates that other materials having low thermal conductivity and sufficient structural stiffness may also be used. Raised portions 416 may include slots 418 to facilitate the flow of condensed water to drain 411, while providing enhanced insulative performance for the AHU. Preferably, the surfaces of the raised portions 416 include a sufficient slope so that water does not accumulate on the raised portions 416. In one embodiment, raised portions 416 may define a chevron-shaped passageway to facilitate the flow of condensed water, preferably having a passageway 422 peripherally extending around the raised portions 416. However, any number of geometric designs that have sufficient surface area to provide enhanced insulative performance for the AHU and additionally provide acceptable water drainage may also be employed.

[0083] Referring to Fig. 30, an embodiment of AHU 30 shows corner fitting caps 200 and structural member caps 234 overlaid over respective corner fittings 16 and structural members 14. One skilled in the art appreciates that splice fitting caps 218, when required, have a similar appearance when overlaid over splice fittings 18. Thus, painting or dyeing the corner fitting caps 200, structural member caps 234 and splice fitting caps 218, which overlay and obscure from view their respective corresponding corner fittings 16, structural members 14 and splice fittings 18, means that the corner fittings 16, structural members 14 and splice fittings 18 do not need to be painted. This results in the need to stock less parts in inventory, as only one configuration of each of the corner fittings 16, structural members 14 and splice fittings 18 needs to be stocked.

[0084] While the invention has been described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is

intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.